

test, by gradual stages to *Ascidia mammillata* (Fig. 5), where the vessels are numerous all over the test, branch freely in its outer layer, and terminate close to the surface in large ovate bulbs, which are usually found filled with blood-corpuscles.

The only part of this history which presents any difficulty is the passage from the Clavelinid to the Cionid arrangement, from the gemmiparous stolon to the first traces of a respiratory system of vessels. This can, I believe, be most satisfactorily explained by assuming that the rudimentary stolons after they had lost their primary function became useful as adhering organs (Figs. 2 and 3), and consequently were retained or possibly increased by the action of natural selection, until their respiratory function became established.

I hope to work out the modifications of the system throughout the various groups of Ascidians in detail, and the results will probably be given in Part II. of the Report on the *Challenger* Tunicata.

W. A. HERDMAN

### NOTES

THE Council of the Royal Astronomical Society have awarded their gold medal to Dr. W. Huggins for his researches on the motions of stars in the line of sight and on the photographic spectra of stars and comets. The presentation takes place at the annual meeting next month. This is the second time that Dr. Huggins has received the medal, he having, in 1867, in conjunction with the late Prof. Miller, received it for his researches in astronomical physics.

THE will of Mr. George Bentham, who died in September last, has been proved by Sir Joseph Dalton Hooker and the Right Hon. Sir Nathaniel Lindley, the executors, the value of the personal estate amounting to over 23,000*l.* The testator bequeaths, among other sums, 1000*l.* each to the Linnean Society of London and the Royal Society Scientific Relief Fund. The residue of his real and personal estate is to be held upon trust to apply the same in preparing and publishing botanical works, or in the purchase of books or specimens for the botanical establishment at Kew; or in such other manner as his trustees may consider best for the promotion of botanical science.

AT the meeting of the Colonial Institute on Tuesday, Gen. Sir Henry Lefroy read a paper on the meeting of the British Association in Canada. Sir Lyon Playfair, M.P., referred to the visit of the British Association as marking a point in the advance of civilisation. Canada's position of having federated, not under the pressure of war, but in a time of profound peace, was unique in the history of the world. The science of Great Britain belonged to the Empire, and it was right that Canada should be the first to try to federate the science of the United Kingdom, and distribute it over the Empire. What Canada wanted was not pure science, but applied science, to bind together her vast territory by railways. But knowing that applied science did not come except pure science preceded it, Canada had had the forethought and wisdom to welcome that pure science to the Dominion. Sir Lyon gave a humorous account of an adventure he had in a wild part of Ottawa with a Scotch mining manager. It turned out that the manager, when in Scotland, had attended the Mechanics' Institute at Glasgow, and afterwards the evening classes at the Andersonian Institution, obtaining a knowledge of chemistry and mineralogy, which had stood him in good stead on emigrating to Canada. From his compatriot he (Sir Lyon) heard of many other Scots of a like type, all of whom had got on well, from the scientific education they had acquired at similar institutions. For such men he did not know any better country than Canada to find openings for

getting on in the world. Prof. G. T. Bonney spoke at some length of the interesting geological formation of Canada, and said he believed that the district north of the St. Lawrence was rich in valuable minerals, and that exploring parties for their discovery should be organised to supplement the systematic geological survey which was being slowly conducted. He condemned the wasteful treatment of the forests that was going on in some of the parts he had visited, and suggested that it was a matter which should engage the attention of the Dominion Government.

ON Tuesday evening Sir Frederick Bramwell gave an address at the Institution of Civil Engineers on his assuming the chair for the first time since his election as president. Sir Frederick's subject was suggested to him by the forthcoming Exhibition of Inventions, his address consisting mainly of a review of some of the most remarkable recent inventions in the application of science to engineering. Sir Frederick has apparently given up hope of our being able to put the tides to any practical use, and hints that Khartoum might have been relieved long ago had our aeronauts been as inventive, or our War Department as enterprising, as those of France.

M. COCHERY, the French Minister of Posts and Telegraphs, was present, on January 2, at Rouen to witness some interesting experiments in telephoning to a great distance. The object was to test the results of the application between Rouen and Havre, a distance of 90 kilometres, of M. Van Rysselberghe's system of instantaneous transmission. The experiment was perfectly successful, and, during more than one hour, messages were exchanged between Rouen and Havre. The Minister announced, on leaving Rouen, that the communication would be open to the public in about a fortnight. Since January 1 the first telephonic offices have been open in Paris, and it is probable that communication will soon be established between Paris and Rouen.

MR. LANT CARPENTER lectures on Sunday at the Sunday Lecture Society, on "The Life and Work of Sir William Siemens," illustrated by experiments, diagrams, and the oxy-hydrogen lanterns. Mr. Carpenter has, we understand, obtained some special materials, of which he will make use in his lecture.

REPORTS from Brussels state that the Spanish earthquake, or a similar simultaneous earthquake, was felt at the Royal Observatory there. The Observatory is stated not to be provided with special instruments for recording earthquakes, as these phenomena are so rare and slight in Belgium. It is said that on December 26 last, the day succeeding the first great shock of the Spanish earthquake, one of the astronomical clocks in the principal meteorological station in the Boulevard de l'Observatoire was stopped, and the other went irregularly. The officer charged with attending to them perceived that the pillars on which they rested had been displaced, and were no longer vertical. On the evening of the same day, M. Lagrange, when about to make some observations, noticed that the large telescope was also displaced. It appears from this that the undulations of the crust of the earth, which have had such disastrous effects in Spain, extended as far as Brussels, and although their effects were not generally appreciable in the latter city, yet they were noticeable in the case of delicate instruments, such as astronomical clocks. It would be interesting to have a precise, authentic statement on this subject, and also to learn whether similar effects were noticed anywhere else in Europe during the last week of the old year.

AT a recent meeting of the German Asiatic Society of Japan a paper was read by Dr. H. Muraoka of Tokio, on the magic mirror of Japan. It is generally supposed that its magical quality was discovered only recently; but it was, says Dr. Muraoka, known for a long time in Japan. Old ladies have

told him that in their youth, fifty years since, they frequently noticed, when at toilet, that the reflection of the sun from the mirror on the wall or ceiling contained the figures or letters on its back. It is said to have been known to the Romans in connection with some of their mirrors, and any one concealing a mirror possessing this quality was arrested as a sorcerer; but the authority for this statement is not given. The subject is engaging considerable attention, as will be seen from the fact that in recent years a list of fourteen writers on the subject is quoted, from Stanislas Julien, in 1847, to Messrs. Ayrton and Perry quite lately; and, as the subsequent discussion showed, there are omissions even in this list. These writers, especially the two latter, have demonstrated beyond doubt that unequal convexities in the mirror beget its magical quality. The polished surfaces are convex, but the convexity is not continuous, and is broken in certain places. After going over what had already been done on the subject, and its results, the author described his own investigations. The riddles of the mirror are far from being all answered by the discovery of unequal convexity. For example, how is the inequality caused—by pressure, heat, or by changes in the molecular tension of the metal plates? The writer tried many experiments to answer the question, and he succeeded by means of chemical agents in drawing lines on the flat back of a mirror, which were reproduced on a reflected image from the front. His results are: That the irregularity in the convexity is caused by the grinding, which alters the molecular tension, that the magic mirror may be produced at will (it was generally supposed to be the work of chance alone), and that the magical quality attributed to it is not confined to Japanese bronze, but is common to all firm, elastic substances. A curious process employed by mirror-workers is described by Dr. Muraoka: it appears to be one of the secrets of the craft. If the surface of a mirror has been made concave by mechanical pressure, the injury is not repaired, as might be expected, by hammering the other side, or otherwise forcing the metal back into its place. The workman takes an iron tool with rounded, but slightly rough, top, and rubs the concave portion of the mirror in all directions, until a fine network of scratches has been formed. The place then rises of itself, and, instead of being concave, becomes more convex than the rest of the surface. This convexity is then shaved away with a knife made for the purpose, until it becomes even with the rest of the mirror. When this is done the whole surface is again ground, polished, and amalgamated.

A STRANGE Japanese custom has, according to the *Japan Mail*, been brought to light by the working of the conscription law. The head of a certain family was instructed that the time had come for his son, whose name was on the census list, to undergo medical examination prior to actual enlistment. The father lost no time in informing the authorities that the individual referred to, though bearing a male name, was his daughter. He explained that having lost two daughters, both about one year old, he had been driven to this expedient to keep the third alive. It appears, further, that in many districts of Japan people still resort, in their anxiety to prolong the lives of their children, to the custom of bestowing upon their offsprings names ordinarily given to infants of the opposite sex, whenever death has made frequent visits to their households. The present case occurred in the capital.

AN important memoir by Lieut. Casey on the North American species of beetles of the sub-family *Stenini* has just been published. It extends to over 200 octavo pages, and describes in minute detail nearly 170 species, of which the greater part are new, and should form one of the most important contributions to systematic entomology in the States that have appeared. "*Stenus*," in the broad sense, is well defined as a whole, but is notoriously difficult in detail. When genera become unwieldy

owing to the mass of species included, it is a convenience to students if they can be split up by recognisable divisional characters. Acting on this idea, Casey has split "*Stenus*" into *Stenus* and *Arens*, on tarsal structure. This subdivision equally affects European (and even British) species.

MR. ALDERMAN W. H. BAILEY, as President of the Manchester Society of Engineers, gave an interesting inaugural address on the 10th inst., his subject being "The Reign of Law in Relation to the Unification of Engineering Work." "The reign of law," Mr. Bailey stated, "is imperial in the domain of the engineer. He deals with forces which have definite, fixed values. If he perceives a quantity or a force he knows that he can identify the same measure or quantity of the like whenever he meets with its equivalents under equal conditions. We know that chance does not rule, and if there be conditions that are indefinite or obscure to us it is not because there is no law, but because we are ignorant of its records." This text Mr. Bailey illustrated by reference to the necessity of exact measurement, supporting his position by numerous examples.

PROF. F. ELGAR is about to deliver a special course of evening lectures, in the University of Glasgow, upon "The Buoyancy and Stability of Ships." The course will consist of twelve lectures, commencing on the 22nd inst. These lectures are intended not only for students of this branch of the science of naval architecture, but also for the convenience of draughtsmen and others who are employed in shipyards during the day, and who are unable to attend the regular University classes.

IN the report of the Meteorological Service of Canada for 1884, attention is again called to the advisability of establishing a marine department in connection with the Meteorological Service for the purpose of organising a system of observations on the ocean by steamers crossing the Atlantic and by those trading with ports in Brazil and the West Indies. Canada, having great shipping interests, should, it is thought, take her part in the great international work now going on of charting the meteorological conditions prevalent over the Atlantic, and in the general development of ocean meteorology. Such observations in the North Atlantic would, it is stated, be of great value, especially in perfecting knowledge of the movements of a particular class of storms. Recent investigations on the subject of the climatic relations of Canada to European countries show that the Dominion has the latitudes of Italy, France, Germany, Austria, the British Islands, Russia, Sweden, and Norway, and has as many varieties of climate as have those countries. There is greater cold in winter in many of the latitudes of Canada than in corresponding latitudes in Europe, but the summers are about the same. The most southern part of Canada is on the same parallel as Rome, Corsica, and the northern part of Spain; it is farther south than France, Lombardy, Venice, or Genoa. The northern shores of Lake Huron are in the latitude of Central France, and vast territories not yet surveyed lie south of the parallel of the northern shores of Lake Huron, where the climate is favourable for all the great staples of the temperate zone.

WITH the new year *Cosmos*, the well-known French scientific journal, will enter on a new period. The size will be increased, in order that larger illustrations may be introduced. It will in future consist of 64 columns, two on a page, each of which will contain more matter than its present page.

THE additions to the Zoological Society's Gardens during the past week include a Pig-tailed Monkey (*Macacus nemestrinus* ♂) from Java, a Macaque Monkey (*Macacus cynomolgus* ♀) from India, a Vulpine Phalanger (*Phalungista vulpina* ♀) from Australia, presented by Mr. J. Church Dixon; a Mouflon (*Ovis musimon* ♂) from Corsica, presented by H.R.H. the Duke of Edinburgh, K.G.; a Vulpine Phalanger (*Phalungista vulpina*)

from Australia, presented by Mr. B. C. Parr; a Short-toed Eagle (*Circus gallicus*) from Suez, presented by Capt. H. E. Robbins; a Lacertine Snake (*Calopeltis lacertina*) from North Africa, presented by Mr. R. F. Sibbald; a Rose-crested Cockatoo (*Cacatua mouccensis*) from Moluccas, deposited; a Black and Yellow Hawfinch (*Mycerobus melanocephalus*) from Yarkland, a ——— Pastor (*Sturnia* ———) from the Andaman Islands, four Starred Tortoises (*Testudo stellata*) from India, a Tuberculated Iguana (*Iguana tuberculata*) from South America, purchased.

#### OUR ASTRONOMICAL COLUMN

THE NAVAL OBSERVATORY, WASHINGTON.—The Report of the Superintendent of this establishment, Commodore S. R. Franklin, to the Navy Department, for the year ending October 31, 1884, has been issued. Great stress is laid upon the importance of commencing the buildings for the new Observatory. The present site is stated to be notoriously unhealthy, and the buildings are in a dilapidated state, and, as the ground for the new Observatory has been purchased and the plans made and approved, the Superintendent urges that Congress should be appealed to during the coming session for a portion at least of the funds required for the new Observatory. His estimate "For the purpose of erecting a new Naval Observatory and necessary buildings upon the site purchased under the Act of Congress, approved February 4, 1880," amounts to 586,138 dollars, or approximately 120,000*l*. The 26-inch equatorial was chiefly employed in observations of the satellites of Neptune, Uranus, Saturn, and Mars; in the case of Uranus, the observations were confined mostly to the two outer satellites, and have now been discontinued, as the favourable time for determining the position of their orbits has passed. Since this instrument was mounted in 1873 observations of the faint satellites of the planets have constituted its main work, and the laborious discussion of the observations, with the view to the correction of orbital elements, was commenced in earnest in August 1883, and is now in a very advanced state, particularly as regards the satellites of Saturn. A report from Prof. Harkness, in charge of the work for the Transit of Venus Commission, is appended: the measurements of the negatives obtained at the various stations was completed last August; the number of photographic plates giving satisfactory results is 932 for the northern and 639 for the southern hemisphere. Prof. Harkness enters into details with respect to these measures, and the method of conducting them, for which reference must be made to the report. The Superintendent regrets that the printing of the Washington observations is not so advanced as is desirable, and proposes applying to Congress for a sum of 1000*l*. annually for a few years, in order to bring up work to date, after which a smaller sum would allow of the due publication of the observations.

THE DEARBORN OBSERVATORY, CHICAGO.—The report of the Director of this Observatory, Prof. G. W. Hough, dated June 18, 1884, has been received within the past week. The work with the 18-inch equatorial was confined, as usual, during the previous year to the observations of a few special objects, including Pons's comet of 1812 on its reappearance, difficult double-stars, the planet Jupiter, and the satellites of Uranus. Thirty-two new double-stars, most of which are difficult, were detected. The companion of Sirius was measured by Prof. Hough on eleven nights, and by Mr. Burnham on ten nights, the mean result being

1884.185 ... Position,  $36^{\circ}6'$ ; Distance,  $8''.45$ .

which, with the observations of recent years, seems to indicate that the period of revolution of the companion is longer than that indicated by theory. The disk of Jupiter was observed on every favourable occasion, and micrometric measures made on the principal spots and markings, including the great red spot first remarked in 1878. With best vision the colour of this object in 1883-84 was "unmistakably a pale pink." The spot is stated to have maintained its size, shape, and outline during the five years it has been observed at Chicago; in this respect experience there has not fully accorded with the impressions of some observers, that the spot had "lost its outline, and become merged in a faint belt on the following end." The most marked change has been in its degree of visibility, but it was seen at

Chicago as long as the planet was observable. Prof. Hough adds that from 1879 to 1883 the spot had a retrograde drift in longitude upon the surface, or, in other words, the apparent rotation of Jupiter was increased from 9h. 55m. 34*os*. in 1879 to 9h. 55m. 38*as*. in 1883. During the last opposition this drift appears to have nearly ceased. The mean period from September 12, 1883, to June 11, 1884, comprising 660 rotations, is 9h. 55m. 38*as*., and the mean for the whole five years of observation is 9h. 55m. 37*os*. The report is accompanied by six tinted lithographs of the appearance of Jupiter's disk. Saturn was frequently examined with the view to detecting markings on the rings, but all observations so far in this direction have been negative. While the rings have been sharply defined, and even the boundary of the dark ring well seen, "nothing indicating a division in the outer ring has ever been noticed." This is not in accord with the conclusion of many other observers provided with telescopes of less optical capacity than the Dearborn refractor.

#### GEOGRAPHICAL NOTES

A SO-CALLED "envoy" of the Mayor of Timbuktu, lately arrived in Paris, has been received by the French President, and introduced to the Geographical Society at its last meeting. On this occasion it was stated that there is no Sultan or military authority in this famous metropolis of Negroland, but only a body of merchants who yearly elect a kind of mayor from amongst themselves. This statement is not quite correct, and, as little is known regarding the internal affairs of the city, the following facts will be acceptable:—For over 200 years Timbuktu has been administered by a "Kahia," a kind of burgo-master, originally appointed by the Emperor of Morocco from the Moorish Andalusian family of Er-Rami some time after the expulsion of the Arabs from Spain. The office became hereditary in this family, and the present Kahia, or "Amir," as he now affects to call himself is Muhammed Er-Rami, whose Negroid features are the result of long alliances with the surrounding Souh-ray population. He commands little influence, and is practically a mere puppet in the hands of whichever of the rival Arab, Imosharh (Berber) or Fulani (Fulah), factions happens for the time being to have the upper hand. The Imosharhs command the whole district between Timbuktu and Arawán, and their Sheikh or "Sultan," Eg-Tandagumu, seems to draw his chief supplies from the plundered caravans passing through his territory. The Arabs, as in the time of Barth, are still ruled by the head of the illustrious El-Bekay family, a branch of the Kuntza tribe, whose present chief is Sheikh Abadin. His policy has long been to side with the Fulani, whose power here, as elsewhere in the Western Sudán, is constantly on the increase, and who threaten to become absolute masters of Timbuktu unless this place falls into the hands of some European power advancing from the west or penetrating up the Niger valley from the south.

ACCORDING to the *Turkistan Gazette*, Dr. Grishimailo, the traveller and entomologist, has concluded his investigations into the natural history of Turkestan for the present. He began his travels in the Fergana Valley, and from thence he went into the Altai region, which he examined thoroughly. In the course of the summer he visited Osch, Arawan, Nankat, Utch-Kurgan, Shahimardan, Karakazyk, Koku, Tekelik, the River Balykty, Karamuk, and Zanku; on his return he visited Karamuk, Jirgetal, Sarzbulak, Kok-u, Altyumazar, and went on foot through the Trans-Altai Mountains to Bordooba and Karakul. The geological collections are very considerable. In lepidoptera alone there are 17,000 specimens, amongst them being many new kinds. The expedition was also a success from an ethnographical and anthropological point of view. Many heights were measured and thermometrical observations made throughout the whole journey. The traveller met many evidences of the existence of a glacial epoch in Central Asia: amongst these are mentioned the presence of forms in Thian-shan, which hitherto have only been found in Labrador, Greenland, Lapland, and the Swiss Alps. Next year Dr. Grishimailo contemplates visiting the western offshoots of the Thian-shan range, because this locality has never yet been examined thoroughly from a geological point of view.

AT the last meeting of the Geographical Society of St. Petersburg, M. Beliaffsky made a communication respecting the journey which he undertook in order to explore the central road